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THE EXPERIMENTAL METHOD AND SOCIOLOGY. II

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Social Legislation is Social Experimentation

ONE of the most interesting sociological experiments of modern times, both because of its method and scope, is the vast social insurance scheme of the German Empire. It is a case of deliberate social experimentation. It is now quite generally recognized that under the contemporary organization of industry which has resulted from the industrial revolution, the great masses of working people of industrial nations receive inadequate wages as tested by the necessity of meeting the inescapable hazards of accident, sickness, death and old age. A knowledge of this fact as well as a variety of separate contributory influences, foremost among which was several years' experience with sick benefits among labor organizations, led the German government to formulate a plan for three branches of insurance—against sickness, against industrial accident, and against old age and invalidity. These respective bills of the year 1881 became laws in 1883, in 1884 and in 1889. Under them millions of German working people have been insured and have received protection which they could not have secured by individual assumption of the risks. Benefits granted under the law are considered payments of legal obligation and not a public charity. The success of this vast experiment seems to be shown by its continuance as a settled policy during a period of great industrial and commercial expansion, and by its recent imitation on the part of Germany's great competitor, England. It is claimed by Germans that no small part of their country's remarkable national unity in The Great War is due to the strengthening effects of thirty years of social insurance among the masses of the people.

But the German experiment was superimposed from above and does not illustrate democratic experimentation. For examples of sociological experimentation more directly initiated and sanctioned by the people, we must turn to England and America. Considering the United States first, we find that social legislation on the Pacific coast constitutes a remarkable example of social experimentation.[28] The principles involved in the experimental direct legislation forms of initiative, referendum and recall, the direct election of senators, the minimum wage and other specific labor class reforms, are too well known to require elaboration here. It will suffice to outline the scope of such legislation by quoting Professor Ogburn, who says:

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[28] Ogburn, W. F., "Social Legislation on the Pacific Coast," *Popular Science Monthly*, Vol. LXXXV., No. 20, March, 1915, pp. 274–289.

> The new states have not hesitated to experiment. It is well to see these experiments in summary. Oregon was the first state to adopt the recall, the direct election of senators, the presidential preference primary, to pass an extensive ten-hour law for women and to put into effect the minimum wage law for women. California was the first state in scientific budget making. Washington was first to abolish private employment bureaus and is first in the efficiency of public schools. Oregon was third to provide for the initiative and the referendum and was first to develop them. Oregon was second to adopt the direct primary and California was second to put into effect a law requiring the reporting of industrial diseases. There were only two states to precede the Pacific coast states in creating mother's pensions. In adopting other social legislation, while not the first, second or third states, Washington, Oregon and California were in a small leading group to legislate on home rule for cities, child labor, hours of labor on public works, factory sanitation and inspection, employers' liability, eugenics, prohibition, prison reform, public utilities, municipal ownership, the social evil and woman suffrage. The success of these experiments may be interpreted by observing the extent to which other states are following their example. . . .[29]

Sociological experiments which aim at better relations of labor and capital, more equable distribution of wealth or more efficient methods of production are seen in the Grange and Farmer's Alliance of America, the California Fruit Grower's Association, the profit-sharing schemes of the Pillsbury Mills of Minneapolis, the Proctor and Gamble Company of Dayton, Ohio, the housing and welfare work of the Lever Brothers at Port Sunlight, near Liverpool, England, and the Cadbury Brothers of Birmingham, England. The list of social experiments of a semi-public nature is well-nigh endless.

But returning to state-initiated experiments, the English experience with social insurance is as yet too brief to permit any satisfactory conclusions. Yet in the field of factory legislation some interesting effects may be observed. It has been pointed out by Professor Karl Pearson[30] that coincident with the era of factory legislation there has been a marked decline in the birth rate of women 15 to 55 years of age in the manufacturing towns. During the period 1864 to 1891, a series of factory acts were passed which applied to bleaching and dyeing works, copper, steel and iron, textile mills and mine work, which restricted the labor of children by raising the age limit and cutting down the hours of work. Educational standards were raised and school attendance enforced by the education acts of this period. As a result, the child ceased to be an economic asset to its parents till the age of 13 or 14 years. Prior to the factory acts a large family was an advantage to a workman, for the children were put to work at an early age and soon contributed to the family income. When the working-age limit was raised and the hours of labor restricted to remedy the inhumane conditions of child labor and to provide education for the younger generation, the immediate economic value of the child was diminished. Pearson claims that the economic value of the child of the labor classes will in the long run govern its production. Hence the decline in the birth-rate of the English laboring classes. But he also claims that the decrease in quantity has not been compensated by better quality, as is ordinarily held, for he maintains that the first-born members of a family are most likely to be abnormal, *i. e.,* neurotic, insane, tuberculous and albinotic, than those subsequently born.[31] Whether we accept the last corollary or not,[32] the diminished birth-rate is an undoubted fact and an unexpected sequel to the factory acts, which shows that all conditions in the experiment were not known at its beginning.

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[29] *Ibid.*, p. 289.

[30] "The Problem of Practical Eugenics."

THE DIFFICULTIES OF EXPERIMENTATION IN SOCIOLOGY

The foregoing account supplements the general impression that the results of much experimental social legislation are as yet indefinite and inconclusive. The difficulty seems to be that every problem is more complex than was first suspected, and in the present state of our knowledge some unforeseen factor usually appears to upset our plans and invalidate our conclusions. In other words, few of the conditions of the experiment are known and consequently it is not possible to attain control. Is this fact fatal for the experimental method in sociology?

We have seen that the method of experiment was to vary one condition at a time and keep others constant or under control. But how know what the others are? Only by the method of trial and error are the other conditions discovered. In the early development of the now exact physical sciences, the method of trial and error was the only method which led to discovery. By this rough method the main conditions have been discovered and the way blocked out. At the present time, with many conditions known, there is a considerable field of experimentation in physical science that is mere repetition by control of conditions previously discovered. The physicist may now set up an experiment with great precision and attain definite results. It may, therefore, be legitimate to distinguish two stages in the experimental method—a pioneer stage of empirical experimentation by the rough trial and error method, and a precise stage when many conditions are known and so easily controlled.

If this distinction is approximately true, then the record of social experimentation would seem to show that the sociologist is still in the first stage of the experimental method. Will he ever attain the second or precise stage of experimentation?

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[31] *Ibid.,* pp. 19–21.

[32] Pearson, K., "On the Handicapping of the First-Born," 1914, and criticism of Pearson's memoir by L. I. Dublin and H. Langman in No. 112 of the *Quart. Pub. of Amer. Statistical Assoc.,* 1916.

Let us first analyze the meaning of the statement that sociological experimentation is in the pioneer stage of trial and error experimentation.

The method of trial and error is a law of very general application in the realm of living things. Regarded from a philosophical point of view it might be said that natural selection is simply the operation of the method of trial and error in the physical world. Organic life is continuously putting out tentatives in the form of spontaneous variations. Some of these variations persist, others perish. Natural selection is the term used to describe the process by which some variations are selected and others rejected. The agents of natural selection are: limitation of food and water supply, draught, climatic change, extremes of heat and cold, storms, wild animals, genetic increase, etc. These agents act upon the structures of organic individuals, producing immediate effects in the extermination of most individuals with inadapted structures, and ultimate results in the survival and perpetuation of individuals with adapted structures. It appears that organic individuals are significant and important from the evolutionary point of view, only as they bear and transmit adapted structures. By this trial and error method, nature finally evolves her adapted type of inhabiting species.

In society there is an analogous process in the principle of social selection. Human beings are continuously putting out tentatives in the form of individual and collective reactions to stimuli. Repetition of these reactions produces habit in the individual and custom in the group. Individual variations from the conduct approved by the group constitute the raw material of social selection. Innovators and radicals are subjected to group pressure to change their ways and to conform. Thus the agents of social selection—group ostracism, persecution and punishment—act upon individuals with anti-social ways, and produce immediate effects in the extermination of anti-social individuals or in the repression of anti-social ways. The ultimate results are seen in the survival and perpetuation of adapted ways and customs. Thus human individuals attain significance from the social evolutionary point of view, only as they bear and transmit adapted habits and customs.

But unlike natural selection, social selection attains its results, the survival and perpetuation of adaptations, by two processes. It is necessary to distinguish these two levels in social selection in order to apprehend the true significance of the trial and error method in society. Natural selection secures the essential adaptation by extermination of inadapted forms. Social selection accomplishes adaptation (in habit and custom) in primitive stages of social development, and to a lessening degree in higher stages, by the extermination of anti-social individuals; but adaptation is also secured by social control which falls short of life destruction and simply represses and constrains.

It is this second aspect of social selection which marks it off from natural selection as a more discriminating process. The survival of adapted structures can not be attained by any means other than the extermination of individuals with inadapted structures, since the structure can not be separated from the individual and because the laws of physical heredity are rigid. If the non-transmissibility of acquired characteristics were not so generally substantiated as a principle of evolution, we might look for the perpetuation of adaptations without physical extermination. On the other hand, the significant thing for society is habit and custom, traits which can be separated from the individual and modified in the individual. Hence adaptation in habit and custom may be secured by constraint. Ostracism, persecution and punishment, are some of the forms of social pressure which lead individuals with anti-social habits and customs to rearrange their mode of conduct and conform to the approved standards. Much of modern educational practice is based upon this fundamental principle.

If it is permissible, as it seems to the present writer, to roughly distinguish two methods in social selection, it would be well to differentiate between them in terminology. The writer, therefore, uses the term social selection to designate the process by which society secures adaptation in individual habit and conduct through the means of excluding or exterminating anti-social individuals, and the term societal selection to designate the process by which society secures the preservation of adapted habits and customs by means of social constraint.

This distinction is in no sense identical with that made by Professor Albert G. Keller[33] between automatic and rational selection as forms of the general social process which he calls societal selection. The present writer considers that Keller's distinction is not more fundamental than this one. Moreover, the distinction just made enables the sociologist to avoid the looser sort of analogical reasoning and to see at once into the heart of the selective process of society. For example, social selection, as defined above, may be both automatic and rational, the group may react suddenly and under stress of emotion cast out or kill the offender, as in the case of a lynching; or the group may exclude or kill the offender after mature deliberation, as in criminal procedure. Similarly, societal selection, as defined above, may be both automatic and rational; the group may react quite thoughtlessly and require conformity to the established customs, as in the ostracism of Gorki; or the group may consider the situation carefully and decide to abolish the offending custom or way, as when a legislature repeals a statute and enacts a new law to take its place with due provision for enforcement and penalties. [The passage of a law which punishes felony with imprisonment or death is an example of rational societal selection, whereas the operation of the law by which the felon is separated from society and imprisoned is an example of rational social selection.]

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[33] "Social Evolution," 1915, especially Chapters 3, 4 and 5.

It should now be clear that collective experimentation of the sort to be compared with the experimental method of the physical scientist is simply rational societal selection.[34] But rational selection as illustrated by the procedure of legislative enactment, the initiative, the referendum, and by the decisions of semi-public or class legislative bodies, is simply the trial and error method carried on by collective action.

The truth of this statement will be recognized when one considers the vast amount of legislation which fails to correct the evils it aims at, and when one considers the numerous group and class experiments that have been inconclusive or even disastrous failures. We are now beginning to understand that legislation and all social experimentation should be guided by a more accurate knowledge of facts. Lester F. Ward said:

> When the people become so intelligent that they know how to choose as their representatives, persons of decided ability, who know something of human nature, who recognize that there are social forces, and that their duty is to devise ways and means for scientifically controlling those forces on exactly the same principles that an experimenter or an inventor controls the forces of physical nature, then we may look for scientific legislation.[35]

Again,

> It must not be supposed that such legislation can be conducted to any considerable extent in the open sessions of legislative bodies. These will doubtless need to be maintained, and every new law should be finally adopted by a vote of such bodies, but more and more this will become merely a formal way of putting the final sanction of society on decisions that have been carefully worked out in what may be called the sociological laboratory. Legislation will consist in a series of exhaustive experiments on the part of true scientific sociologists and sociological inventors working on the problems of social physics from the practical point of view. It will undertake to solve not only questions of general interest to the state—the maintenance of revenues without compulsion and without friction and a smooth and peaceful conduct of all the operations of a nation—but questions of social improvement, and amelioration of the condition of all the people, the removal of whatever privation may still remain, and the adoption of means to the positive increase of the social welfare, in short the organization of human happiness.[36]

SOCIAL EXPERIMENTATION AND THE STATISTICAL METHOD

We are still in the trial and error stage of social experimentation. It will be some time before all the conditions of any social problem are known and probably many years before precise experimentation is possible. But assuming that the sociologist will eventually attain a state of more complete knowledge of social conditions such that the factors entering into any social problem are known, may he not then pass into the precise stage of social experimentation?

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[34] *Ibid.*, Chs. 4, 5.

[35] ''Applied Sociology,'' 1906, p. 338.

[36] *Ibid.*, also ''Dynamic Sociology,'' Vol. II., p. 156.

The difficulty which prevents precise methods in sociological experimentation is inherent in its data. Social units are complex as compared with the relatively simple units of other sciences. In physical science the units operated upon are homogeneous, standardized; whether in China or America, given the controlled conditions, the experiment will work, it may be repeated. But in sociology the units are not homogeneous or standardized; every unit is unique, individual, different; moreover, there is the constant bias of race, government, standard of living and political ideals. An experiment in China proves little or nothing for America. Welfare experiments, housing reforms, model villages, unemployment insurance, though successful in Germany and England, prove nothing final and conclusive for Americans. Every one of these schemes must be rearranged and adapted to American conditions before it will work—and then the result may be something new, quite unlike the European model. Moreover, while the sociologist is experimenting with human units the factors change, the problem assumes a new aspect, as when legislation to correct an abuse comes after some unforeseen economic factor has already eliminated the evil (American tariff laws and European wars and disturbances). Thus do fundamental differences in race, government, political ideals, and standard of living constitute the uncontrolled conditions which invalidate conclusions that may be drawn from much social experimentation.

It is for the sociologists of the future to attain that stage at which there is complete knowledge of conditions entering into many social problems. Since the contemporary sociologist is denied this advantageous knowledge and is also hampered by the fundamental variability of his data, it would seem that precise results from the experimental method in society are impossible. Is there any means which may be used to supplement the deficiencies and correct some of the faults of the trial and error method applied to the solution of social problems?

Social scientists are beginning to recognize that an efficient tool lies at hand in the statistical method. Two illustrations will serve to show how the statistical method applied to the data of sociology helps to obviate those hindrances to the use of the experimental method which are due to imperfect control and heterogeneity of data.[36a]

In the first place, the statistical method helps the sociologist to discover the separate effects or relations of different factors in a given social problem. The marriage-rate and trade per head of population are two sociological variables usually said to be closely related in such a fashion that the marriage-rate fluctuates according to the general prosperity of the country, as shown by the course of trade. But a plot of the marriage-rate over a series of years indicates that there are at least three types of fluctuations superimposed. There is the general tendency of decline in the marriage-rate, the fluctuations caused by alternate periods of general business prosperity or depression, and the seasonal fluctuations due to custom. There is also a complex oscillation in the course of trade: the prosperity-depression fluctuations, and a gradual rise in the trade curve. Mr. R. H. Hooker[37] has computed the coefficient of correlation[38] of the series of marriage-rates with the series of values per head of exports of British and Irish produce for the period 1861–1895, and found $r = 0.18$, with a probable error of 0.09—a very low coefficient, indicating no connection between the two. The difficulty was that the difference in the general movements of the two curves had completely overshadowed the minor oscillations. In order to eliminate the disturbing influence of these diverse general movements and measure the relation of the fluctuations of the marriage-rate with the prosperity-depression cycle of trade, the "moving average" or "trend" was computed and the deviations from the trend used in working out a second correlation coefficient. Thus computed, the correlation was 0.80, probable error 0.04, a high coefficient, showing marked connection between the two series. But since fluctuations in the marriage-rate follow upon oscillations in trade, it is necessary to make allowance for this lag. Using a lag of half a year, *i. e.*, correlating the marriage-rate with the exports of half a year earlier, a maximum coefficient of 0.86 was found. Here, then, is a case involving complex conditions which are beyond the control of the social scientist, yet by means of statistical devices it has been possible to measure the strength of one relation at a time and to form a definite idea of the importance of this relation.

[36a] The statistical method may be defined as the group of principles which governs the collection, classification, tabulation and interpretation of numerical facts.

In the second place, the statistical method helps the sociologist to overcome some of the hindrances to precise sociological results, caused by individuality of the units and the consequent heterogeneity of aggregates. The known diversity of personal characteristics seems to thwart any formulation of valid generalization no matter how careful the initial observations. Since every human individual is in a sense a unique case, different from all other human individuals, generalizations must be based upon a vast number of observations if they are to be valid. But in most cases the number of observations which the sociologist can make is strictly limited. Consequently he must rely upon a more or less restricted series of observations to represent the totality of his phenomena. Right here the statistical method furnished valuable aid in its theory and method of sampling.[39] By selecting at random a sample numerically large in relation to the variation among items in the wider universe, a representative group is obtained. The obstacle presented by the diversity of individual characteristics within the sample group may be largely overcome by selecting the form of the average best adapted to the particular data under consideration. For example, when extreme observations are regarded as important, the mean or arithmetic average is usually selected because it gives due weight to extremes; when extreme observations are not important or when the data are not susceptible of measurement in units, the observations may be ranged in order of their size and the mid-most observation, or median, is used as the average; and when there is a distinct central tendency or grouping, the most frequently occurring observation, or mode is used as the average. Furthermore, since in general, the deviations of particular observations from the average follow some ascertainable law, it is possible to attain quite a precise definition of the group and thus overcome many of the difficulties that arise because of the individuality of items and their aggregate heterogeneity.[40] Generalizations arrived at by this process avoid many of the qualifications ordinarily introduced by the fact of excessive variability in sociological observations. In this way the sociologist may partially overcome the second great obstacle to precise methods in his field. It may, therefore, be said that the statistical method bears to scientific method in sociology much the same relation that the experimental method bears to precise methods in physical science.

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[37] "Correlation of the Marriage-Rate with Trade," *Jour. Royal Statistical Society*, Vol. LXIV., 1901, pp. 485–492.

[38] A measure of the closeness of relation of two associated variables, computed by means of Karl Pearson's coefficient $r = \Sigma(xy)/n\sigma_x\sigma_y$, where x are deviations from the average of one series, y are deviations from the average of the related series, σ_x and σ_y are measures of the dispersion of each series in terms of their respective averages, and n is the number of observations.

SUMMARY

To recapitulate: The experimental method has brought notable achievements in physical science. This method consists in controlling all conditions associated with a given effect save one condition, and varying that one. The experimental method has been used in such diverse fields as physics, botany and psychology—can it be used in sociology? Sociologists have already observed the effects of natural experiments—the effect of isolation on the Eskimo, the operation of Malthus's law and natural selection among the Chinese—but have sociologists ever actively interfered with the determining conditions of a social problem to the extent of attaining control of the conditions?

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[39] Yule, G. U., "Introduction to the Theory of Statistics," chapters on sampling, and Chapin, F. S., "Elements of Scientific Method in Sociology," *Amer. Jour. Sociology,* Vol. XX., No. 3, Nov., 1914, pp. 371–391.

[40] See Zizek, F., "Statistical Averages," also writings of Edgeworth and Pearson in the *Journal of the Royal Statistical Society* and the *Philosophical Transactions* of the Royal Society.

The social reformer is constantly hindered by moral and superstitious objections to practise of his plans. Even experimentation upon live animals is not sanctioned by all people, in spite of results that have promoted human welfare. Where should the line be drawn between experiments upon live animals and human beings? The voluntary renunciation of personal rights and the assumption by the state of the power to override personal rights are the only justifications for experimentation upon human beings. Society is the only official sociological experimenter. The utopian communities of New Harmony, Brook Farm and the North American Phalanx are examples of community experimentation in simplest terms. But the results of these experiments were inconclusive because the experiment was performed in the social medium. They failed to secure the essential condition of isolation. A good example of sociological experimentation sanctioned by the state is seen in the state socialism of Germany and England. Unexpected results of some of these experiments show that all conditions of the problem were not known. Is inability to control all the conditions in a social problem fatal for the experimental method in sociology? In physical science the conditions of a problem were first discovered by the method of trial and error. When the conditions were known, more precise methods of experiment were possible. Thus the experimental method passes through two stages: a pioneer stage of trial and error, and a stage of more precise experimentation. Sociological experimentation is clearly in pioneer stage of feeling its way. Collective activity is carried on by the trial and error method. There is a social selection of adapted ways analogous to the natural selection of adapted structures. But the selection of adapted ways is by two processes: social selection, involving individual exclusion or extermination; and societal selection, involving constraint and social control. Both social and societal selection are forms of collective experimentation by the trial and error method. Legislative action is societal selection in the trial and error stage of the experimental method, since the results of so much social legislation are inconclusive. But when all the conditions of social problems have been discovered by the trial and error method, may not the sociologist then pass on to the precise stage of the experimental method? The data of sociology are so complex and observations show such great variation, that precise methods seem impossible. Is there, then, no way to overcome hindrances to precise methods of experimentation in sociology which are due to limited control and complexity of data? The statistical method helps to analyze out conditions of cause and effect, and assists in overcoming the difficulties presented by complexity of data. In conclusion, the statistical method bears to scientific method in sociology much the same relation that the experimental method bears to precise methods in physical science.